Shirley Shum Spring, 2013

Water, Energy, and Sustainability

Instructor: Shakira Castronova

**Title: Water, Water, Everywhere-Where does it all go… in New York City?**

Grade: 4th grade

**Learning objectives and standard alignments:**

**New York State Learning Standards**

Students will observe how NYC’s storm water management system effects both biotic and abiotic systems. Standard 4 Science Living Environment

3. Individual organisms and species change over time.

5. Organisms maintain a dynamic equilibrium that sustains life.

6. Plants and animals depend on each other and their physical environment.

7. Human decisions and activities have had a profound impact on the physical and living environment.

Blooms Taxonomy: synthesis and evaluation

**New York City Performance Standards**

Students will demonstrate knowledge of storms that contribute to flooding in their neighborhood of Battery Park City (most recently Super Storm Sandy). Standard 5-Scientific Thinking

1. Asks questions about natural phenomena; objects and organisms’ and events and discoveries

During their trip to the Brooklyn Bridge Park’s storm water management set up students will be responsible for recording observations in their journal. Standard 8-Scientific Investigation

1. Demonstrates scientific competence by completing a systematic observation, such as a field study.

Blooms Taxonomy: knowledge, comprehension, and application

Professional goal 3c from Danielson frameworkCompetency 3C Engaging Students in Learning

**Materials, Resources, and Equipment**

|  |  |  |  |
| --- | --- | --- | --- |
|  | Pre-Trip | During | Post/Extension |
| Materials/Equipment | Science journal  smartboard | Science journal  Pencils  Colored pencils  Vials with caps  pH paper | Science journal  Smartboard  Poster paper  Coloring mediums |
| Resources | NYC  Environmental Protection website:  [Using Green Infrastructure to Manage Stormwater](http://www.nyc.gov/html/dep/html/stormwater/using_green_infra_to_manage_stormwater.shtml)  [Map of CSO Outfalls along NYC's waterfront](http://www.nyc.gov/html/dep/pdf/green_infrastructure/cso_outfalls_map.pdf) (PDF)  **Streetside Infiltration Swale at 99th Avenue** |  | NYC  Environmental Protection website:  [PlaNYC 2030 – A comprehensive sustainability plan for the NYC’s future](http://www.nyc.gov/html/planyc2030/html/home/home.shtml)  **Enhanced Tree Pit at Autumn Avenue**  **Benefits of Green Infrastructure** |

**Background:**

I teach in a school located in Battery Park City and during Super Storm Sandy and the previous Hurricane Irene, this area was considered Zone A-a mandatory evacuation zone. I think it is important that these students have the opportunity to reflect upon the impact of stormwater, in particular their city’s underwater drainage system and how it effects them personally and their environment. The Brooklyn Bridge Park Conservancy’s education program (K-12) offers programs to schools that highlight the park’s features. The following is taken from the Brooklyn Bridge’s park website describing their stormwater management space:

“Stormwater collected from Brooklyn Bridge Park's landscape and adjacent buildings is circulated through a series of above-ground landscape elements that function as ecological treatment systems prior to entering underground storage. The stored water supplies much of the park's irrigation needs. While this type of sustainable system improves the environmental performance of the park, it is also visible to park users, helping to raise public awareness of the way that our city interacts with the natural world. On [Pier 1](http://www.brooklynbridgepark.org/the-park/pier-1-open) storage tanks can accommodate 104,000 gallons of stormwater. Storage tanks are also located under [Pier 6](http://www.brooklynbridgepark.org/the-park/pier-6-open) and the Empire Fulton Ferry.” (<http://www.brooklynbridgepark.org/sustainability/stormwater-management>). Taking student’s on a trip here will give them a first hand look at how a stormwater-management system operates.

**Procedures and Timing**

Pre-Trip 45 minutes

* At work tables, draw a picture of what you see in your neighborhood after it rains so much that there is flooding. Guiding questions: Where does flooding take place? How does it effect you and others? If you were here and can remember what it was like during and after Super Storm Sandy that may contribute to your ideas.
* After the pre assessment activity, students will share out their ideas and drawings at their worktables. 15minutes
* 2-3 students will share out to the whole group. I will select students who mentioned or showed flooding from sewer systems.
* Students will come over to the rug with journals and a pen. Using the smart board for projection, the question “What are the effects of flooding from storm water on our cities sewer systems?,” is written.
* Students will think and jot down ideas for 5 minutes. Turn and talk for 4 minutes and as a whole group discuss ideas for 6 minutes.
* Via power point I will introduce the following vocabulary to familiarize the students with the different types of sewer drainage systems in New York State. Using the NYC Environmental Agency website, I will show diagrams of the 3 sewer areas as well.

10 minutes

**Combined Sewer Areas:** In most areas of the City, sanitary and industrial wastewater, rainwater and street runoff are collected in the same sewers and then conveyed together to the City's treatment plants. This is known as a combined sewer system. Approximately 70 percent of the City sewers are combined.

**Separate Sewer Areas:** In some New York City neighborhoods, sanitary waste and storm water runoff are channeled in separate sewer systems: sanitary waste is carried to wastewater treatment plants while storm water is channeled directly to local streams, rivers, and bays.

**Unsewered Areas:** In unsewered areas, such as parks and wetlands, this water is absorbed into the ground or channeled into waterways.

(Vocabulary from the NYC Environmental Agency)

End with the map of NYC sewer types that show locations and go over homework. 5 minutes

* Homework. Students will get a copy of the map of NYC sewer types that show locations of sewers in the 5 boroughs. In their journal students need to record:

1. Observations of the Map of NYC Sewer System Types.
2. Why do you think combined sewer areas, separate sewer areas, and unsewered areas are located where they are?
3. Describe the difference between the 3 types NYC sewer areas.

During: Day trip. Prior to the trip, I would have gone over the trip with the students as well as the specifics of the five activities.

In trip groups at Brooklyn Bridge Park, students work together to gather data during the following five activities:

1. In the science journal sketch a picture of the Brooklyn Bridge Park’s storm water management set up. Include labels and captions where information is given.
2. Using the storm water samples from the management system, students test the pH of water and make inferences regarding the storm water based on pH.
3. Analyze the biotic features that are in and around the Brooklyn Bridge Park
4. Discuss and record the habitat of organisms in and around Brooklyn Bridge Park.
5. Discuss and record the properties of the environment and adaptations of Brooklyn Bridge Park.

Each group will have a chance to do everything, just not at the same time. After twenty minutes the group along with the parent chaperone will rotate to the next activity.

Post trip back in the classroom: 45 minutes

At work tables trip groups start their jigsaw activity.

Each group is responsible to create a poster with drawings and captions that explain an aspect of one of the 5 data gathering activities. I will hand each group an index card with the activity they are in charge of. 30 minutes.

Students do a gallery walk of the posters and record any notes in their journal that they may have missed during the trip. 10 minutes

Go over homework assignment 5 minutes.

Homework: In an essay, discuss the health of the East River on a day-to-day basis as well as what happens after the area has experienced sewer flooding. Use prior knowledge as well as information learned from the Brooklyn Bridge trip regarding the NYC Storm Water Management System.

**Assignments**

Pretrip :

* Warm up activity
* Whole group, at the rug share out and vocabulary work.
* Homework. Students will get a copy of the map of NYC sewer types that show locations of sewers in the 5 boroughs. In their journal students need to record:

1. Observations of the Map of NYC Sewer System Types.
2. Why do you think combined sewer areas, separate sewer areas, and unsewered areas are located where they are?
3. Describe the difference between the 3 types NYC sewer areas.

During:

* The five activities.

Posttrip:

* Jig saw activity.
* Independent gallery walk and note taking in student journal.
* Homework: In an essay, discuss the health of the East River on a day-to-day basis as well as what happens after the area has experienced sewer flooding. Use prior knowledge as well as information learned from the Brooklyn Bridge trip regarding the NYC Storm Water Management System.

**Assessment**

Pretrip :

* Warm up activity
* Whole group at the rug share out and vocabulary work.
* Homework:

What does the student observe about the Map of NYC Sewer System Types?

Does the student infer why they think the three sewer areas are located where they are?

Can the student describe the three types NYC sewer areas?

Homework graded as check plus (3 responses written in complete and thoughtful sentences.) check (2 responses are written in complete and thoughtful sentences) or check minus (1response written in complete and thoughtful sentences.)

During:

* The five activities students are responsible for as discussed in procedure.

Can students take a sample of run off water, test for pH and read the appropriate level?

At each activity, are students journaling and discussing the particular focus question?

Posttrip:

* Jig saw activity.
* Independent gallery walk and note taking in student journal.
* Homework: In an essay, discuss the health of the East River on a day-to-day basis as well as what happens after the area has experienced sewer flooding. Use prior knowledge as well as information learned from the Brooklyn Bridge trip regarding the NYC Storm Water Management System.

The rubric to grade essay is the rubric that is used by the common core-aligned task with instructional supports in literacy grade 4. Please see other attached document pp 8-9. Students should be familiar with this rubric as they are going to be graded accordingly during the ELA.

**Extension**

A lesson on showing how NYC prepares itself for future floods from super storms.

Using the NYC Environmental Department website show:

[PlaNYC 2030 – A comprehensive sustainability plan for the NYC’s future](http://www.nyc.gov/html/planyc2030/html/home/home.shtml) ( this shows NYC’s plan for improving upon NYC’s water sewer treatment system

Show examples of places around the city that show sustainable projects such as: Enhanced Tree Pit at Autumn Avenue and Benefits of Green Infrastructure

Bibliograpy:

**Websites**

1. <http://www.nyc.gov/html/dep/html/stormwater/index.shtml>
2. <http://www.brooklynbridgepark.org/sustainability/stormwater-management>

Books

1. Brunvand, Jan H. *Too Good to Be True: The Colossal Book of Urban Legends*. New York: W.W. Norton, 1999, pp. 182-185.

A fun urban legend to read about alligators in the NYC sewer system.

**ARticles**

1. ["History of New York City's Water Supply System"](http://nyc.gov/html/dep/html/drinking_water/history.shtml). [*New York City Department of Environmental Protection*](http://en.wikipedia.org/wiki/New_York_City_Department_of_Environmental_Protection). Retrieved 2009-12-08.
2. DePalma, Anthony (July 20, 2006). ["New York’s Water Supply May Need Filtering"](http://www.nytimes.com/2006/07/20/nyregion/20water.html). [*The New York Times*](http://en.wikipedia.org/wiki/The_New_York_Times). Retrieved 2010-02-20.